Title: Maniac Musicians

Brief Overview:

Through the use of musical notes, students will recognize and apply the use of the addition of fractions with unlike denominators in a real-life situation.

NCTM 2000 Principles for School Mathematics:

- **Equity:** *Excellence in mathematics education requires equity - high expectations and strong support for all students.*
- **Curriculum:** *A curriculum is more than a collection of activities: it must be coherent, focused on important mathematics, and well articulated across the grades.*
- **Teaching:** *Effective mathematics teaching requires understanding what students know and need to learn and then challenging and supporting them to learn it well.*
- **Learning:** *Students must learn mathematics with understanding, actively building new knowledge from experience and prior knowledge.*
- **Assessment:** *Assessment should support the learning of important mathematics and furnish useful information to both teachers and students.*
- **Technology:** *Technology is essential in teaching and learning mathematics; it influences the mathematics that is taught and enhances students' learning.*

Links to NCTM 2000 Standards:

- **Content Standards**

Number and Operations

- *Understand numbers, ways of representing numbers, relationships among numbers, and number systems; recognize equivalent representations for the same number and generate them by decomposing and composing numbers; develop understanding of fractions as parts of unit wholes, as parts of a collection, as locations on number lines, and as divisions of whole numbers; use models, benchmarks, and equivalent forms to judge the size of fractions; and recognize and generate equivalent forms of commonly used fractions, decimals, and percents.*
- *Compute fluently and make reasonable estimates; develop fluency in adding, subtracting, multiplying, and dividing whole numbers; develop and use strategies to estimate the results of whole-number computations and to judge the reasonableness of such results; develop and use strategies to estimate computations involving fractions and decimals in situations relevant to students' experience; and use visual models, benchmarks, and equivalent forms to add and subtract commonly used fractions and decimals.*

Algebra

- *Understand patterns, relations, and functions; describe, extend, and make generalizations about geometric and numeric patterns; and represent and analyze patterns and functions, using words, tables, and graphs.*

- *Use mathematical models to represent and understand quantitative relationships; and model problem situations with objects and use representations such as graphs, tables, and equations to draw conclusions.*

Measurement

- *Understand measurable attributes of objects and the units, systems, and processes of measurement; and carry out simple unit conversions, such as from centimeters to meters, within a system of measurement.*

- **Process Standards**

Problem Solving

- *Instructional programs from prekindergarten through grade 12 should enable all students to build new mathematical knowledge through problem solving; solve problems that arise in mathematics and in other contexts; apply and adapt a variety of appropriate strategies to solve problems; and monitor and reflect on the process of mathematical problem solving.*

Communication

- *Instructional programs from prekindergarten through grade 12 should enable all students to organize and consolidate their mathematical thinking through communication; communicate their mathematical thinking coherently and clearly to peers, teachers, and others; analyze and evaluate the mathematical thinking and strategies of others; and use the language of mathematics to express mathematical ideas precisely.*

Connections

- *Instructional programs from prekindergarten through grade 12 should enable all students to recognize and apply mathematics in contexts outside of mathematics.*

Representation

- *Instructional programs from prekindergarten through grade 12 should enable all students to create and use representations to organize, record, and communicate mathematical ideas; and use representations to model and interpret physical, social, and mathematical phenomena.*

Grade/Level:

Grades 3-5

Duration/Length:

Four days

Prerequisite Knowledge:

Students should have working knowledge of the following skills:

- Fractional parts of a whole
- Addition of fractions with unlike denominators

Student Outcomes:

Students will:

- identify the value of different musical notes based on 4 beats per whole note.
- create number sentences showing addition of fractions with unlike denominators to represent the value of each measure of music.
- compose and perform, using clapping or percussion instruments, six measures of music using 4/4 time.

Materials/Resources/Printed Materials:

- Percussion instruments (optional)
- Pencils
- Copies of Student Resource Sheets #1, #2, #3, and #4 for each student
- Teacher Resource Sheets
- Scrap paper or math journal for solving number sentences
- Transparencies of Student Resource Sheets #1, #3, #4
- Transparencies of Student Resource Sheet #5 - one for each pair of students
- Transparency pens - one pen for each pair of students
- Markers
- Chart with the title ***Music in Math*** and separated into two columns labeled ***Predictions*** and ***Learned***

Development/Procedures:

Day One

- **Warm Up** - Elicit prior knowledge by initiating a discussion of music. For example: Favorite songs, musical instruments played by students, favorite music videos, etc.
- Follow up discussion by saying, "What if I told you that musicians need to know math in order to be successful. Why do you think this is so?"
- Record student responses on the chart under the ***Predictions*** column.
- Say, "Now we will do some activities that will help us to understand how musicians use mathematics."
- **Procedure** - Distribute Student Resource Sheet #1***, What's It Worth?***
- Using whole-group discussion and the transparency of ***What's It Worth***, discuss and complete the resource sheet (See Teacher Resource Sheet #1 for correct answers).
- Distribute Student Resource Sheet #2, ***Clap It Out***. Review directions and practice clapping the first measure.
- Have students practice clapping the resource sheet in pairs.
- The class will then come together and perform the composition several times as a large group.
- **Closure** - Revisit the chart and ask the question, "Why do you think musicians need to know math? Does anyone have anything to add to our predictions?"

Day Two

- **Warm Up** - Practice and perform the composition learned on Day One (Student Resource Sheet #2, ***Clap It Out***).
- Conduct a brief discussion regarding any observations students have about the written measures of music on Student Resource Sheet #2, ***Clap It Out***. Acceptable responses include: We always count to four; The notes look similar; Some notes are different colors; We don't clap on rests; etc.

- **Procedure** - Distribute Student Resource Sheet #3, ***Try This!***
- Using the transparency of Student Resource Sheet #3, ***Try This!***, model the correct way to complete the first measure of music (See Teacher Resource Sheet #2 for correct responses).
- Allow students about 10 minutes to complete the sheet individually or in pairs.
- Use the transparency of Student Resource Sheet #3 , ***Try This!***,to have students come up and label each measure of music (See Teacher Resource Sheet #2 for correct responses).
- As each measure is completed, randomly select students to clap it out.
- When the resource sheet is complete, have students practice clapping the composition with a partner.
- Clap the composition several times as a large group.
- **Closure** - Return to the chart and lead a discussion on how students now think that mathematics relate to music. Record appropriate responses on the ***Learned*** section of the chart. Some responses should include: Each measure equals four beats; Each measure equals one whole; Some notes have the same names as fractions; Some notes are worth more than others.

Day Three

- **Warm Up** - Perform the two compositions, ***Clap It Out*** and ***Try This!***, using various modes; for example, snapping, tapping desks, tapping feet, whistling, etc.
- **Procedure** - Distribute Student Resource Sheet #4, ***Add It Up***. Read directions and discuss the example.
- Ask student to explain why the 1/2 note was changed to 2/4 (**recall adding of unlike denominators**).
- Allow students 10 to 15 minutes to complete the resource sheet.
- Check and discuss the correct responses to Student Resource Sheet #4, ***Add It Up***, using the transparency (See Teacher Resource Sheet #3 for correct responses).
- Using a transparency of Student Resource Sheet #5, On Your Own, model how to use their new knowledge of musical notes to correctly write music in 4/4 time. Complete six measures of music using teacher modeling and student input.
- Perform this new composition as a group.
- Say, "Now that you know how to read musical notes and write music in 4/4 time, you will be able to write your own original musical composition with a partner."
- Introduce and discuss the criteria for the successful completion of the activity (See Teacher Resource #4, ***Scoring Rubric***, for the scoring criteria).
- Distribute transparencies of Student Resource Sheet #5, ***On Your Own***, and transparency pens - one of each per pair of students.
- Working with a partner, allow students time to work on six measures of original music written in 4/4 time directly onto their transparencies. See **Extension/Follow Up** activities as suggestions for students who finish early.

*** Students will run out of time on this day to complete the activity. Stop at an appropriate time and do closure.**

- **Closure** - Tell the students that you know that they have not finished and that they will have time to finish during the next class period. Call on students to share what strategies are working well in their pairs and/or what challenges they have come upon thus far. Other students may offer constructive suggestions.

Day Four

- **Warm Up** - Call on students to recall the criteria needed to successfully complete the task.

- **Procedure** - Distribute transparencies of Student Resource Sheet #5, ***On Your Own***, and transparency pens - one of each per pair of students.
- Working with a partner, allow students sufficient time to complete six measures of original music written in 4/4 time directly and to practice clapping out their compositions. See **Extension/Follow Up** activities as suggestions for students who finish early.
- Each pair of students will perform their composition using clapping or percussion instruments while displaying their transparency.
- Allow Praise, Question, Polish time after each performance. Encourage students to use the criteria on the Scoring Rubric to express their evaluation of the work of other students.
- Teacher will evaluate the composition and performance of each pair using the provided rubric (See Teacher Resource Sheet #4, ***Scoring Rubric***).
- **Closure** - Return to the chart for a final time. Elicit all appropriate math-related concepts experienced in this task. Record students responses under the ***Learned*** section of the chart. Responses should include: You need to understand fractions; You need to be able to add fractions; You need to know how to add fractions with unlike denominators; You need to understand the concept of a whole measure.

Performance Assessment:

- Students will be assessed on the musical composition meeting the given criteria (See Student Resource Sheet #6, ***"On Your Own" Checklist*** and Teacher Resource Sheet #4, ***Scoring Rubric***).
- Students will be assessed on the successful completion of Student Resource Sheet #4, ***Add It Up***.
- St137[133] udents will be assessed on contributions made to the chart ***Music in Math***.
- Students will be assessed on an ongoing basis through teacher observation, participation, and cooperative group effort.

Extension/Follow Up:

- Students may compose six measures of music using varied time signatures.
- Students could write an expository selection in which they explain the method used to compose their original musical composition (See Extension Resource Sheet #1).
- Teacher may add sixteenth notes to Student Resource #1 and then students may write another original musical composition using sixteenth notes.
- Using Student Resource Sheet #4, students may create additional ways to express the written music utilizing other whole number operations.

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Name _____ Date _____

What's It Worth?

Directions: Using the given information that a whole note is worth four beats, identify the value of the other notes and rests given. Then write the fractional value of each note on the line to the left.

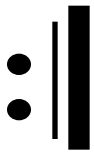
_____  whole note = 4 beats

_____  half note = _____ beats

_____  quarter note = _____ beats

_____  eighth note = _____ beats
(= 2 eighth notes; read "1 and ")

_____  1 & quarter rest = _____ beats

 Repeat all measures up to this point one time.

$\frac{4}{4}$ Time signature. The numerator indicates the number of beats per measure.

Name _____ Date _____

What's It Worth?

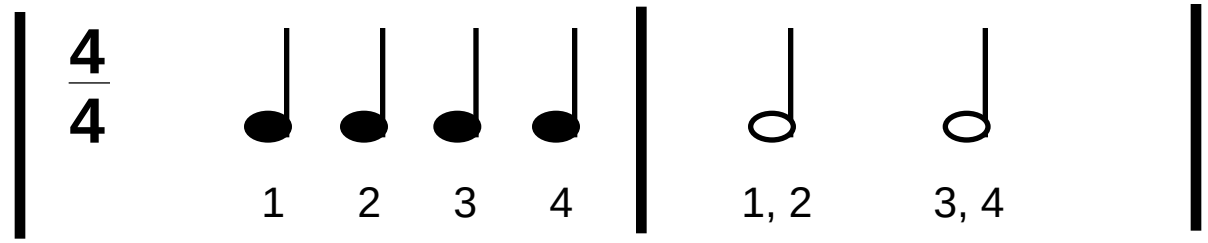
Directions: Using the given information that a whole note is worth four beats, identify the value of the other notes and rests given. Then write the fractional value of each note on the line to the left.

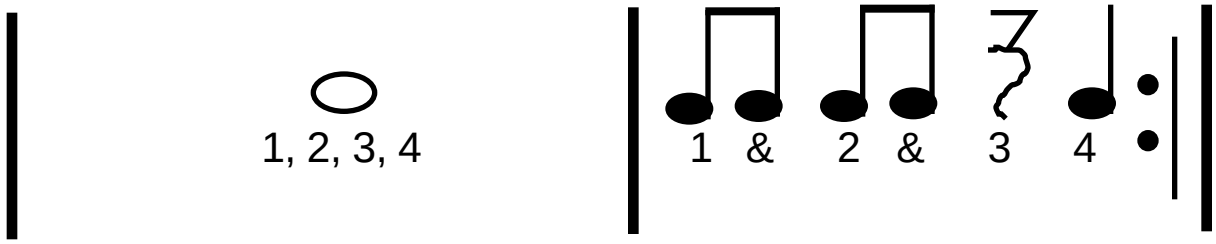
1 Whole		whole note	=	4	beats
1/2		half note	=	2	beats
1/4		quarter note	=	1	beats
1/8		eighth note *(= 2 eighth notes; read "1 and ")*	=	1/2	beats
1/4		1 & quarter rest	=	1	beats
		Repeat all measures up to this point one time.			
	$\frac{4}{4}$	Time signature. The numerator indicates the number of beats per measure.			

Name _____ Date _____

Clap It Out

Directions: Clap out these six measures of music using 4/4 time. Use the note values under each note to help.



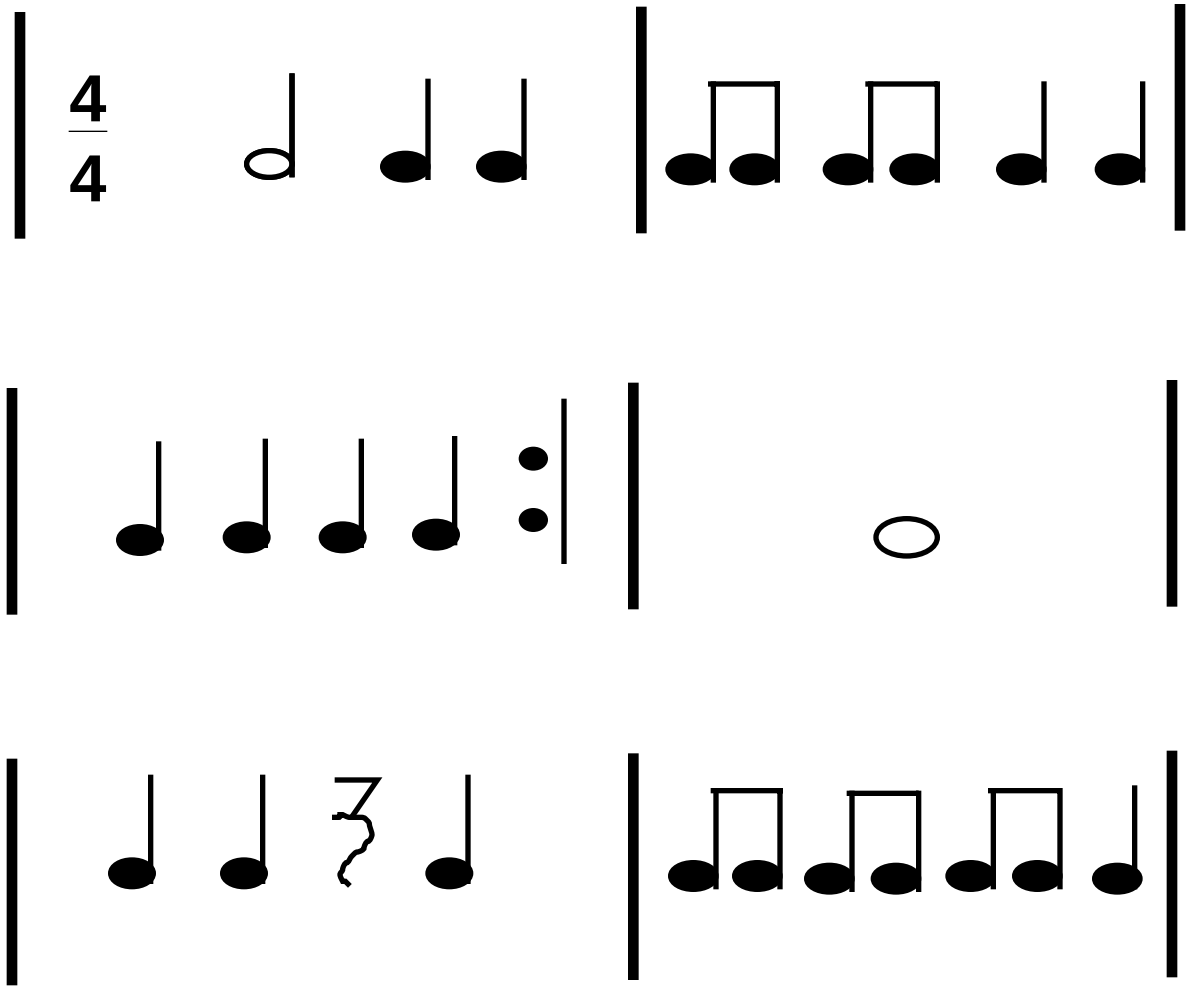


(repeat)

Name _____ Date _____

Try This!

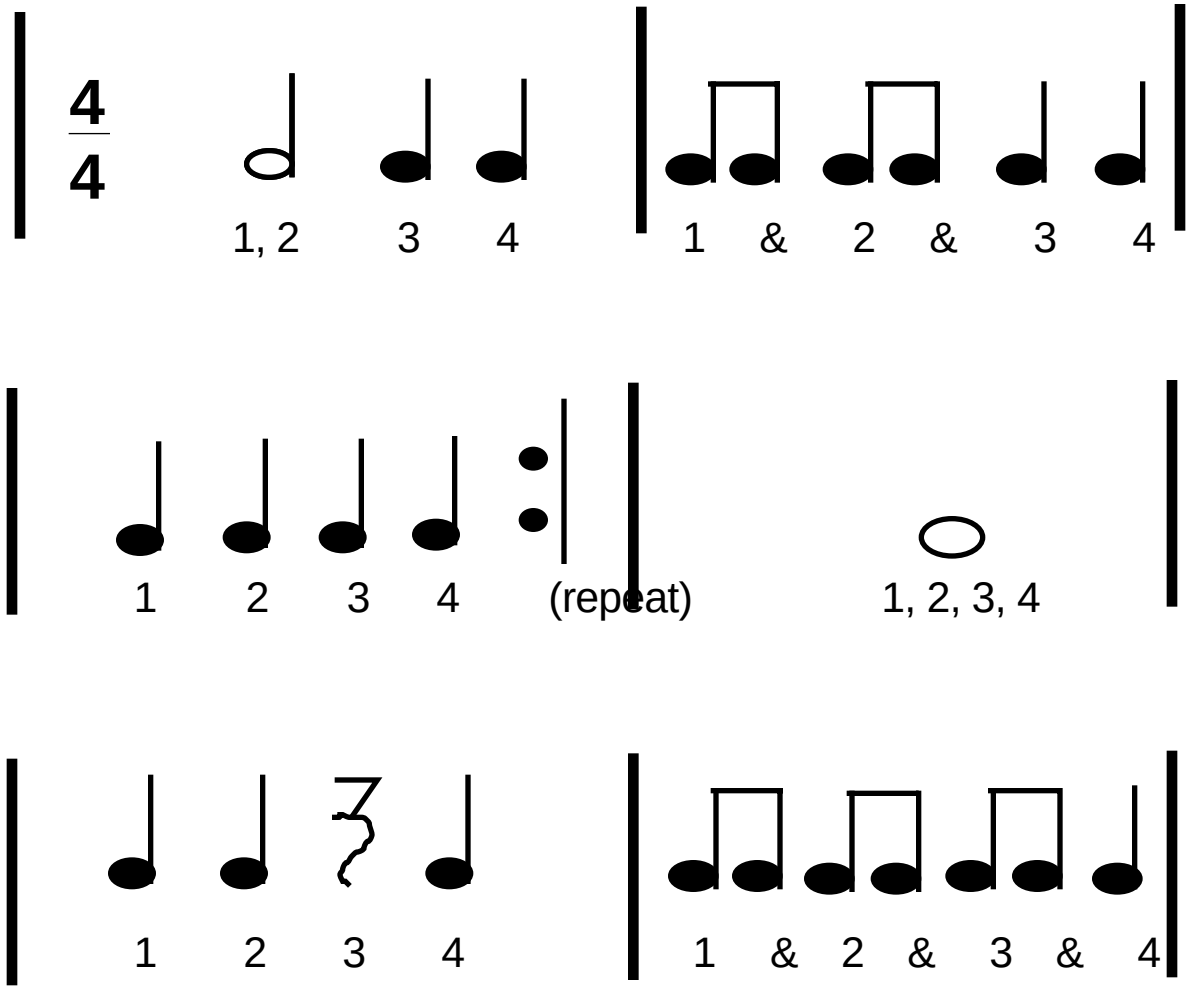
Directions: Write the beat values under each note. Clap out the six measures of music using 4/4 time.



Name _____ Date _____

Try This!

Directions: Write the beat values under each note. Clap out the six measures of music using 4/4 time.



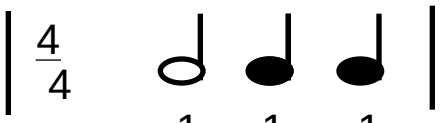
Student Resource #4

Name _____ Date _____

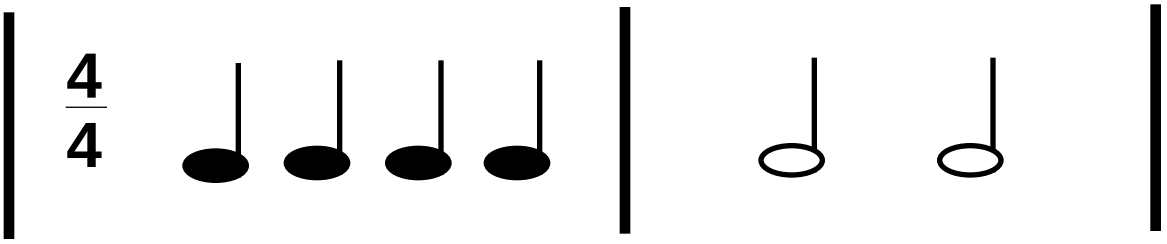
Add It Up

Directions: Using your "What's It Worth" sheet, label each note with its fractional value. Create a number sentence for each measure and solve. Use scrap paper if needed.

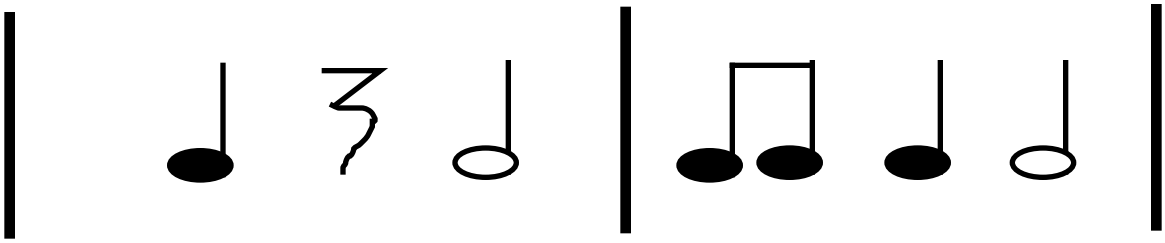
Example:



$\frac{1}{2} \quad \frac{1}{4} \quad \frac{1}{4} = \frac{2}{4} + \frac{1}{4} + \frac{1}{4} = \frac{4}{4} = 1$



_____ _____



_____ _____

Write a sentence explaining what conclusion you can draw about each measure of music.

_____

_____

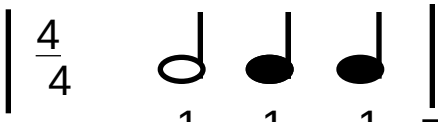
Teacher Resource #3

Name _____ Date _____

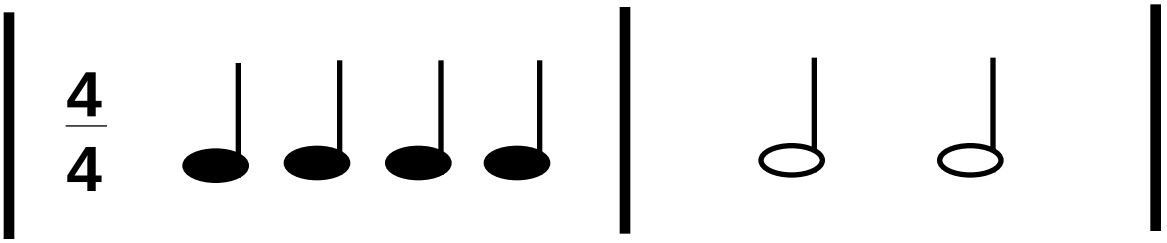
Add It Up

Directions: Using your "What's It Worth" sheet, label each note with its fractional value. Create a number sentence for each measure and solve. Use scrap paper if needed.

Example:

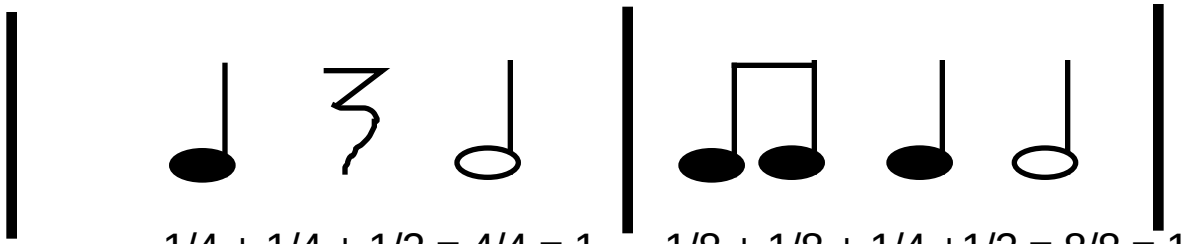


1/2 + 1/4 + 1/4 = 2/4 + 1/4 + 1/4 = 4/4 = 1



1/4 + 1/4 + 1/4 + 1/4 = 4/4 = 1

1/2 + 1/2 = 2/2 = 1



1/4 + 1/4 + 1/2 = 4/4 = 1

1/8 + 1/8 + 1/4 +1/2 = 8/8 = 1

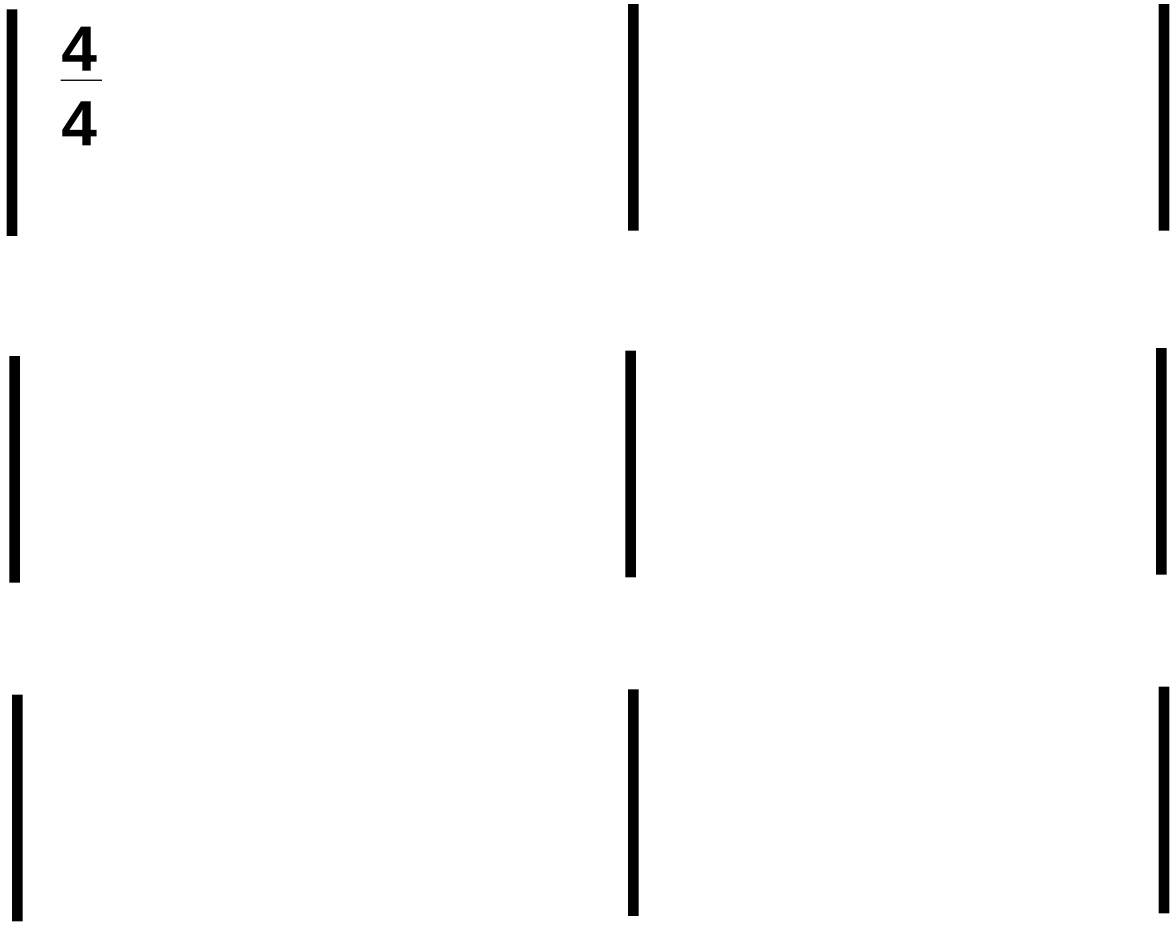
Write a sentence explaining what conclusion you can draw about each measure of music. **Example of an appropriate response: All of the measures equal one whole.**

Student Resource #5

Name _____ Date _____

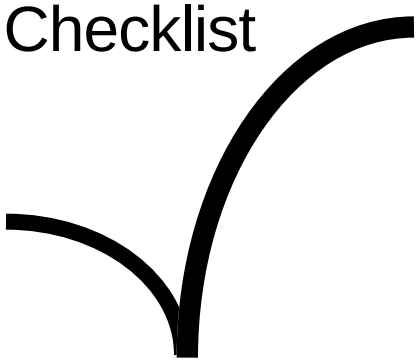
On Your Own

Directions: Individually or with a partner, compose six measures of music using 4/4 time. Use each type of note and rest at least once. Write the beat values under each note.



Name _____ Date _____

"On Your Own" Checklist



Did I . . .

_____ Complete six measures of music?

_____ Use each type of note at least once?

_____ Use the rest at least once?

_____ Use 4/4 time (make sure each measure equals one whole)?

_____ Write the beat value under each note and rest?

SCORING RUBRIC

Original Musical Composition:

3

- Included six measures of music.
- Used each type of note at least once.
- Used at least one rest.
- All six measures were correctly written in 4/4 time.
- Labeled each note and rest with the correct beat value.

2

- Included six measures of music.
- Used at least three notes.
- Four to five measures are correctly written in 4/4 time.
- Labeled each note and rest with few errors

1

- Included at least four measures of music.
- Used only one or two different notes.
- Two to three measures are correctly written in 4/4 time.
- Labeled each note and rest with several errors.

0

- Included three or fewer measures of music.
- Completed six measures of music but no measures of music are correctly written in 4/4 time.
- Completed six measures of music but beat values are incorrect or have many errors.
- Non-participation.

Explain It

You and your partner worked hard to create your musical composition. Others would like to know the process you used to complete this task.

Think about ways in which you made decisions. Think about how you planned out each measure. Think about why you chose the rhythms for each measure. Use an organizer to collect your thoughts.

Write an expository paragraph in which you fully explain how you composed your selection. Remember to use paragraph form. Also remember to proofread your work for appropriate capitalization, language usage, punctuation, and spelling!